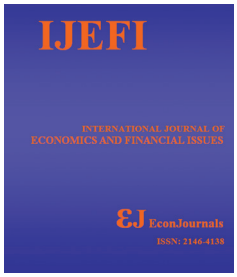

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Financial Performance and ESG in the EU's Core: Effects of the Russian-Ukraine War and Post-COVID Recovery

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ABSTRACT

This study examines the impact of sustainability efforts on financial performance by analyzing the relationship between environmental, social, and governance (ESG) scores and financial performance in 653 companies across the European Union, with a focus on the "Blue Banana" region during the economic instability caused by the COVID-19 pandemic and the Russia-Ukraine war. Using financial indicators such as ROA, ROE, and ROI, the research challenges the belief that sustainability drives financial success and mitigates risks during periods of economic instability. The findings reveal a significant negative effect of the ESG disclosure score on ROA and ROI, while ROE remains unaffected. Companies with higher ESG scores incur additional costs related to sustainability, which can hinder short-term profitability and asset efficiency. Larger and older companies perform better financially, highlighting the role of operational maturity. Additionally, the environmental score negatively impacts ROA due to the costs associated with sustainability practices. These results suggest that the economic trade-offs of ESG integration are more pronounced during periods of instability, offering valuable insights for policymakers and business leaders. This paper contributes to the debate on corporate sustainability in mature markets during economic turmoil, questioning the presumed link between sustainability and financial performance in times of crisis.

Keywords: ESG, Economic Instability, EU's Economic Core, COVID-19, Russia-Ukraine War, Operational Maturity, Financial Risk Mitigation
JEL Classifications: G32; M14; Q56

1. INTRODUCTION

Environmental, Social, and Governance (ESG) performance has garnered significant attention in literature for its positive relationship with financial outcomes. However, the impact of ESG initiatives during times of economic instability—such as the COVID-19 pandemic and the ongoing geopolitical turmoil caused by the Russia-Ukraine war, remain less explored. These crises have introduced unprecedented challenges for businesses, including supply chain disruptions, inflationary pressures, and uncertainty about global economic recovery. In this volatile environment, companies must balance short-term financial performance with the costs associated with ESG initiatives. Scholars like Barnett (2007) and Marsat and Williams (2011) have suggested that firms may face trade-offs when prioritizing ESG goals, particularly in turbulent periods that demand significant financial investments.

The economic core of the European Union—comprising Belgium, France, Germany, Italy, Luxembourg, and the Netherlands (Also know as the Blue Banana)—has long been at the forefront of integrating ESG practices, supported by robust regulatory frameworks that incentivize ESG investment and reporting. However, the economic volatility triggered by the COVID-19 pandemic and the ongoing Russia-Ukraine conflict has introduced new challenges, raising the question: Can firms in these stable, mature markets sustain or even enhance their ESG efforts amidst such instability? These crises have underscored the importance of governance, risk management, and long-term resilience—core tenets of ESG performance—while also highlighting the potential financial burdens companies may face in aligning with ESG standards in the short term.

This study investigates the relationship between ESG scores and financial performance—measured by return on assets (ROA),

return on equity (ROE), and return on investment (ROI)—among companies in the EU's economic core. The findings will provide valuable insights for investors, policymakers, and other stakeholders about the potential costs and benefits of integrating ESG practices in times of economic turbulence, thereby contributing to the broader literature on sustainable finance.

2. LITERATURE REVIEW

A wealth of research has explored the financial implications of ESG integration, revealing complex, often region-specific dynamics. Many studies have identified a positive relationship between ESG performance and financial outcomes. For instance, Eccles et al. (2014) found that companies with strong ESG practices tend to outperform financially, a pattern observed across diverse contexts, from Germany (Velte, 2017) to China's energy sector (Zhao et al., 2018). Yet, contrasting perspectives also emerge. Scholars like Brammer et al. (2006) and Nollet et al. (2016) have reported a negative correlation between certain ESG activities and financial metrics, highlighting potential trade-offs companies face when prioritizing ESG initiatives. This tension is especially pronounced in markets where short-term financial gains may be hindered by the costs associated with ESG investments (Barnett, 2007; Marsat and Williams, 2011).

Europe, particularly the founding members of the European Union—Belgium, France, Germany, Italy, Luxembourg, and the Netherlands—stands at the forefront of ESG integration. These nations have pioneered frameworks and regulatory standards that promote ESG investment and reporting, creating fertile ground for sustainable finance (Hu and Loh, 2018; Ioannou and Serafeim, 2017). Rooted in longstanding commitments to governance, environmental protection, and social welfare, the EU's founding states have shaped a regulatory environment conducive to sustainable practices, positioning them as models for ESG integration globally. This unique historical and economic context presents an ideal setting for examining the nuanced relationship between ESG and financial performance.

Numerous studies have established a positive correlation between ESG performance and financial outcomes. Early work by Orlitzky et al. (2003) and van Beurden and Gössling (2008) found a significant positive relationship between corporate social responsibility (CSR) and financial performance, a trend supported by more recent studies.

For example, Eccles et al. (2014) highlighted that companies with strong ESG practices often outperform their peers financially. In Germany, Velte (2017) demonstrated that higher ESG scores are associated with increased profitability, particularly measured by Return on Assets (ROA). In China's energy sector, Zhao et al. (2018) reported similar findings, linking higher ESG scores to improved financial performance. Dalal and Thaker (2019) extended this analysis to Indian companies, showing that ESG performance positively impacted financial success between 2015 and 2017.

In the US, Fatemi et al. (2018) found that ESG activities and transparency through reporting enhance profitability by mitigating weaknesses and leveraging corporate strengths. Bhaskaran et al. (2020) and De Lucia et al. (2020) echoed these results in various regional contexts, reinforcing that ESG practices are a crucial driver of financial success. Naeem et al. (2021) further supported this view, showing that both individual ESG components and aggregate scores significantly correlate with profitability in emerging markets. Chairani and Siregar (2021) also noted that ESG practices increase the impact of Enterprise Risk Management (ERM) on profitability, particularly when integrated into business models.

Despite the positive associations, some studies have identified negative correlations between ESG performance and financial outcomes. Barnett (2007) argued that CSR investments could detract from shareholder value by reallocating funds toward non-profitable activities. Supporting this notion, Brammer et al. (2006) found that companies with lower social scores performed better financially in the UK.

In Italy, Landi and Sciarelli (2019) examined 54 listed companies and identified a negative correlation between ESG scores and financial performance. Similarly, Marsat and Williams (2011) demonstrated that CSR ratings often negatively impacted financial performance, especially when considering MSCI ESG ratings. Nollet et al. (2016) also revealed that social performance was negatively associated with profitability in linear regression models. Further evidence was provided by Duque-Grisales and Aguilera-Caracue (2021), who found a negative relationship between ESG performance and financial outcomes in multinational firms based in Latin America. Garcia and Orsato (2020) confirmed these results in emerging markets, where ESG scores did not always align with improved financial results.

Several studies present mixed results regarding the ESG-financial performance link. Han et al. (2016) found no significant relationship between social scores and financial outcomes, while governance scores positively influenced financial performance, and environmental scores had a negative impact. Saygili et al. (2022) also reported a complex picture, with environmental reporting negatively affecting financial performance, while governance and stakeholder management had positive effects.

Similarly, Atan et al. (2018) found no conclusive evidence of a relationship between ESG scores and firm profitability in Malaysia. Giannopoulos et al. (2022) and Behl et al. (2022) highlighted both positive and negative impacts of ESG on financial performance, pointing to variations depending on the specific dimensions of ESG under consideration. Lopez-de-Silanes et al. (2020) found that ESG scores had no significant effect on financial performance in a multi-country study.

Various factors influence the relationship between ESG performance and financial outcomes. Larger, more profitable companies often have greater resources to engage in ESG practices. Studies by Moore (2001) and Artiach et al. (2010) emphasize that larger firms are more likely to invest in sustainable initiatives due to their size and available resources. McWilliams and Siegel (2000) suggested that when R&D expenditure is

considered, the relationship between sustainability and profitability may become neutral.

The regulatory environment also plays a pivotal role. Ioannou and Serafeim (2017) demonstrated that companies in countries with robust institutions tend to have better ESG performance. Additionally, board characteristics significantly influence ESG adoption, as firms with larger boards and more frequent meetings tend to engage in higher-quality ESG reporting, which is usually what is characterized by large cap companies (Hu and Loh, 2018).

A firm's financial performance can be measured using various accounting-based and market-based indicators, with profitability ratios being the most widely used. Ghosh (2013) highlighted the link between sustainability performance and improved financial outcomes. Return on Assets (ROA), Return on Equity (ROE), and Return on Investment (ROI) are the most commonly used measures, as discussed by Albertini (2013), Hou et al. (2016), Lech (2013), and Naeem et al. (2021).

This study adopts ROA, ROE, and ROI to assess financial performance, as they offer comprehensive insights into both operational efficiency and investor returns. ROA reflects the efficiency of asset usage, while ROE assesses how effectively a company utilizes shareholders' equity. ROI measures the profitability of investments, providing a market-based perspective on financial performance.

3. RESEARCH METHODOLOGY AND DATA

Table 1 provides a summary of the dataset, which includes data from 653 companies across six Western European countries: Belgium, France, Germany, Italy, Luxembourg, and the Netherlands. The dataset contains 6,530 data points, representing a comprehensive sample of financial and ESG-related variables from these countries. Germany accounts for 39.51% and France 30.93%, Italy contributes 16.39%, while Belgium, the Netherlands, and Luxembourg represent smaller portions of the sample, with shares of 6.13%, 5.05%, and 1.99%, respectively.

This study utilizes data from Bloomberg ESG, focusing on the economic core of the EU (also referred to as The Blue Banana), namely Belgium, France, Germany, Italy, Luxembourg, and the Netherlands. The dataset comprises 653 observations for the year 2022. The countries in this study are grouped together to represent the EU countries that traditional drive the EUs economy, rather than being treated as individual entities. Due to the historical economic and political significance of these countries (the economic motor of the EU), this grouping allows for a unified analysis that reflects their collective influence within the European Union.

Table 1: Overview of company country distribution

Country	Companies	Data points	% of sample
Belgium	40	400	6.13
France	202	2020	30.93
Germany	258	2580	39.51
Italy	107	1070	16.39
Luxembourg	13	130	1.99
Netherlands	33	330	5.05
Total	653	6530	100

The research aims to test four hypotheses regarding the impact of ESG factors—Overall ESG Score, Environmental Score, Social Score, and Governance Score—on financial performance. For each hypothesis, three separate regression analyses will be conducted, corresponding to the three financial performance indicators: Return on Investment (ROI), Return on Assets (ROA), and Return on Equity (ROE) (See Appendix A for a variable overview). This results in a total of 12 regression analyses, as outlined below:

3.1. Hypothesis 1: Overall ESG Performance

- Hypothesis 1A: Overall ESG and ROA
  H_0 (Null Hypothesis): ESG performance does not affect ROA in the EU's Economic Core during periods of economic instability.
  H_1 (Alternative Hypothesis): ESG performance affects ROA in the EU's Economic Core during periods of economic instability.

- Hypothesis 1B: Overall ESG and ROE
  H_0 (Null Hypothesis): ESG performance does not affect ROE in the EU's Economic Core during periods of economic instability.
  H_1 (Alternative Hypothesis): ESG performance affects ROE in the EU's Economic Core during periods of economic instability.

- Hypothesis 1C: Overall ESG and ROI
  H_0 (Null Hypothesis): ESG performance does not affect ROI in the EU's Economic Core during periods of economic instability.
  H_1 (Alternative Hypothesis): ESG performance affects ROI in the EU's Economic Core during periods of economic instability.

3.2. Hypothesis 2: Environmental (E) Score

- Hypothesis 2A: Environmental Score and ROA
  H_0 (Null Hypothesis): The environmental (E) score does not affect ROA in the EU's Economic Core during periods of economic instability.
  H_1 (Alternative Hypothesis): The environmental (E) score affects ROA in the EU's Economic Core during periods of economic instability.

- Hypothesis 2B: Environmental Score and ROE
  H_0 (Null Hypothesis): The environmental (E) score does not affect ROE in the EU's Economic Core during periods of economic instability.
  H_1 (Alternative Hypothesis): The environmental (E) score affects ROE in the EU's Economic Core during periods of economic instability.

- Hypothesis 2C: Environmental Score and ROI
  H_0 (Null Hypothesis): The environmental (E) score does not affect ROI in the EU's Economic Core during periods of economic instability.

H_1 (Alternative Hypothesis): The environmental (E) score affects ROI in the EU's Economic Core during periods of economic instability.

3.3. Hypothesis 3: Social (S) Score

- Hypothesis 3A: Social Score and ROA
  H_0 (Null Hypothesis): The social (S) score does not affect ROA in the EU's Economic Core during periods of economic instability.
  H_1 (Alternative Hypothesis): The social (S) score affects ROA in the EU's Economic Core during periods of economic instability.

- Hypothesis 3B: Social Score and ROE
  H_0 (Null Hypothesis): The social (S) score does not affect ROE in the EU's Economic Core during periods of economic instability.
  H_1 (Alternative Hypothesis): The social (S) score affects ROE in the EU's Economic Core during periods of economic instability.

- Hypothesis 3C: Social Score and ROI
  H_0 (Null Hypothesis): The social (S) score does not affect ROI in the EU's Economic Core during periods of economic instability.
  H_1 (Alternative Hypothesis): The social (S) score affects ROI in the EU's Economic Core during periods of economic instability.

3.4. Hypothesis 4: Governance (G) Score

- Hypothesis 4A: Governance Score and ROA
  H_0 (Null Hypothesis): The governance (G) score does not affect ROA in the EU's Economic Core during periods of economic instability.
  H_1 (Alternative Hypothesis): The governance (G) score affects ROA in the EU's Economic Core during periods of economic instability.

- Hypothesis 4B: Governance Score and ROE
  H_0 (Null Hypothesis): The governance (G) score does not affect ROE in the EU's Economic Core during periods of economic instability.
  H_1 (Alternative Hypothesis): The governance (G) score affects ROE in the EU's Economic Core during periods of economic instability.

- Hypothesis 4C: Governance Score and ROI
  H_0 (Null Hypothesis): The governance (G) score does not affect ROI in the EU's Economic Core during periods of economic instability.
  H_1 (Alternative Hypothesis): The governance (G) score affects ROI in the EU's Economic Core during periods of economic instability.

To analyze these relationships, the data will be processed using SPSS, and multiple linear regression will be employed. Before performing the analysis, all variables will be transformed as necessary to meet the assumptions of multiple linear regression. The regression models for each dependent variable (ROI, ROA, and ROE) will use the same set of independent and control variables.

The general model applied is as follows:

$$Y_{2022} = \beta_0+\beta_1*ESGDiscScore+\beta_2*EnviromentalDisclosureScore+\beta_3*SocialDisclosureScore+\beta_4*GovernanceDisclosureScore+\beta_5*Age\ In\ Years+\beta_6*MarketCap+\beta_7*RampDExp+\epsilon$$

Where:

- Y_{2022} represents ROA, ROE and ROI which are the dependent variables.
- ESGDiscScore represents the overall ESG score.
- EnviromentalDisclosureScore, SocialDisclosureScore, SocialDisclosureScore, and GovernanceDisclosureScore represent the Environmental, Social, and Governance scores, respectively.
- Age in years is the control variable representing the age of the company (control variable).
- LG10MarketCap is the market cap (control variable).
- LG10RampDExp is the R&D expenditure (control variable).
- β_0 is the intercept, and ϵ is the error term.

By performing regression analyses in this manner, the study aims to assess the influence of ESG factors on the financial performance of firms within the EU's economic core. This approach contributes to a deeper understanding of the relationship between ESG dimensions and financial outcomes, such as ROI, ROA, and ROE, in a region that positions itself as a global leader in sustainability.

4. RESULTS

This section presents the results of the regression analyses conducted to investigate the relationship between ESG performance and financial performance in companies within the EU's economic core. The study evaluated four hypotheses, focusing on the impact of overall ESG scores and the individual components—Environmental (E), Social (S), and Governance (G)—on financial performance, which was assessed using Return on Investment (ROI). To account for potential influences beyond ESG performance, control variables such as Market Capitalization, Company Age, and R&D Expenditure were included, as recommended by previous studies.

Regression analyses were performed using Return on Assets (ROA), Return on Equity (ROE), and Return on Investment (ROI) as the dependent variables. The primary independent variable was the ESG Disclosure Score, while the control variables comprised company age, market capitalization, and R&D expenditure. The findings for each financial performance measure are presented in the following sections.

4.1. Hypothesis 1: Overall ESG Performance

4.1.1. Hypothesis 1A: Overall ESG and ROA

The analysis of Hypothesis 1 examines the impact of overall ESG performance on three financial performance metrics: ROA, ROE,

and ROI, for companies within the EU's economic core. Hypothesis 1A explores the relationship between ESG performance and ROA. The results (Table 2a and Table 3a) indicate that the ESG Disclosure Score has a statistically significant negative impact on ROA (B = −0.071, P < 0.01), suggesting that higher ESG scores are associated with lower asset efficiency. This may imply that companies investing in ESG initiatives face higher costs, which reduce their ability to generate returns from their assets in the short term. The model has an R-squared value of 0.071, meaning approximately 7.1% of the variance in ROA is explained by ESG performance and the included control variables. Among the control variables, Age (B = 0.023, P < 0.01) is positively and significantly associated with ROA, indicating that older companies tend to achieve higher ROA, potentially due to accumulated experience and efficiencies. Log Market Capitalization (B = 2.677, P < 0.01) also has a positive and significant impact, suggesting that larger firms are more efficient in utilizing their assets. Conversely, Log R&D Expenditure (B = −0.065, P > 0.05) does not show a statistically significant effect, implying no clear influence of R&D spending on ROA.

4.1.2. Hypothesis 1B: Overall ESG and ROE

For Hypothesis 1B, which investigates the relationship between overall ESG and ROE, the results (Table 2b and Table 3b) indicate that ESG Disclosure Score has a negative but not statistically significant effect on ROE (B = −0.073, P > 0.05). As the relationship is not significant, we fail to reject the null hypothesis, suggesting that ESG scores do not significantly influence the ability of companies to generate returns on equity in the EU's economic core. The R-squared value of 0.053 indicates that 5.3% of the variance in ROE is explained by the model. Control variables reveal that Age (B = 0.048, P < 0.01) is positively and significantly associated with ROE, supporting the notion that older firms are better positioned to generate shareholder returns. Similarly, Log Market Capitalization (B = 1.437, P < 0.01) has a positive and significant effect, suggesting that larger firms have better equity returns due to their scale and resources. Log R&D Expenditure (B = −0.027, P > 0.05), however, is not statistically significant, showing no impact on ROE.

4.1.3. Hypothesis 1C: Overall ESG and ROI

Lastly, Hypothesis 1C evaluates the effect of overall ESG performance on ROI. The results (Table 2c and Table 3c) demonstrate that the ESG Disclosure Score has a significant negative effect on ROI (B = −0.080, P < 0.01), indicating that higher ESG scores are linked with lower ROI, likely due to costs associated with implementing ESG practices that reduce investment efficiency. The R-squared value for this model is 0.052, showing that 5.2% of the variance in ROI is explained by ESG performance and the control variables. Regarding the control variables, Age (B = 0.028, P < 0.01) is positively and significantly related to ROI, consistent with its effect on ROA and ROE, reinforcing the idea that older firms, through experience and established operations, achieve better returns on investment. Log Market Capitalization (B = 1.312, P < 0.01) also has a positive and significant influence, suggesting that larger firms, due to their scale efficiencies, achieve higher ROI. However, Log R&D Expenditure (B = 0.141, P > 0.05) is not statistically significant in this model, indicating no direct impact on ROI for these companies.

4.2. Hypothesis 2: Environmental (E) Score

4.2.1. Hypothesis 2A: Environmental score and ROA

The analysis of Hypothesis 2 examines the impact of the Environmental (E) score on three financial performance metrics: ROA, ROE, and ROI, for companies in the EU's economic core. For Hypothesis 2A, which explores the relationship between the Environmental score and ROA, the results (Table 4a and Table 5a) indicate that the Environmental Disclosure Score has a statistically significant negative impact on ROA (B = −0.020, P < 0.05), suggesting that higher environmental scores are associated with lower asset efficiency. This finding may imply that companies that invest heavily in environmental initiatives encounter increased costs, potentially limiting their ability to generate returns from their assets in the short term. The model has an R-squared value of 0.056, indicating that approximately 5.6% of the variance in ROA is explained by the Environmental performance and the included control variables. Among the control variables, Age (B = 0.060, P < 0.01) is positively and significantly associated with ROA, implying that older companies tend to achieve higher ROA, likely due to accumulated experience and operational efficiencies. Additionally, Log Market Capitalization (B = 0.399, P < 0.01) exhibits a positive and significant impact, suggesting that larger firms are more efficient in utilizing their assets. Conversely, Log R&D Expenditure (B = −0.078, P > 0.05) does not show a statistically significant effect, indicating no clear influence of R&D spending on ROA.

4.2.2. Hypothesis 2B: Environmental score and ROE

For Hypothesis 2B, which investigates the relationship between the Environmental score and ROE, the results (Table 4b and Table 5b) indicate that the Environmental Disclosure Score has a negative but not statistically significant effect on ROE (B = −0.037, P > 0.05). Since the relationship is not significant, we fail to reject the null hypothesis, suggesting that the Environmental score does not significantly influence the ability of companies to generate returns on equity in the EU's economic core. The R-squared value of 0.051 indicates that 5.1% of the variance in ROE is explained by the model. Control variables reveal that Age (B = 0.017, P < 0.01) is positively and significantly associated with ROE, supporting the notion that older firms are better positioned to generate shareholder returns. Similarly, Log Market Capitalization (B = 0.834, P < 0.01) shows a positive and significant effect, suggesting that larger firms have better equity returns due to their scale and resources. However, Log R&D Expenditure (B = −0.162, P > 0.05) is not statistically significant, indicating no impact on ROE.

4.2.3. Hypothesis 2C: Environmental score and ROI

Lastly, Hypothesis 2C evaluates the effect of the Environmental score on ROI. The results (Table 4c and Table 5c) demonstrate that the Environmental Disclosure Score has a significant negative effect on ROI (B = −0.017, P < 0.05), indicating that higher environmental scores are linked with lower ROI, likely due to the costs associated with implementing environmental practices that may reduce investment efficiency. The R-squared value for this model is 0.043, showing that 4.3% of the variance in ROI is explained by Environmental performance and the control variables. Regarding the control variables, Age (B = 0.540, P < 0.01) is positively and significantly related to ROI, consistent with its

Table 2a: Model summary: Hypothesis 1A: Overall ESG and ROA

Model	R	R square	Adjusted R square	Standard error of the estimate
1	0.266[a]	0.071	0.065	6.90038

Table 2b: Model summary: Hypothesis 1B: Overall ESG and ROE

Model	R	R square	Adjusted R square	Standard error of the estimate
1	0.231[a]	0.053	0.047	14.50273

Table 2c: Model summary: Hypothesis 1C: Overall ESG and ROI

Model	R	R square	Adjusted R square	Standard error of the estimate
1	0.229[a]	0.052	0.046	10.31663

[1]Indicates that the correlation coefficient (R) is statistically significant at the 0.05 level.

Table 3a: Coefficients: Hypothesis 1A: Overall ESG and ROA

Model	Unstandardized coefficients		Standardized coefficients	t	Significance	95.0% confidence interval for B	
	B	Standard error	Beta			Lower bound	Upper bound
1							
(Constant)	−18.633	3.217		−5.791	0.000	−24.951	−12.315
ESG disc score	−0.071	0.021	−0.176	−3.396	0.001	−0.112	−0.030
Age	0.023	0.008	0.109	2.810	0.005	0.007	0.039
LG10MarketCap	2.677	0.417	0.328	6.413	0.000	1.857	3.496
LG10RampDExpAdd1	−0.065	0.076	−0.034	−0.847	0.397	−0.215	0.085

Table 3b: Coefficients: Hypothesis 1B: Overall ESG and ROE

Model	Unstandardized coefficients		Standardized coefficients	t	Significance	95.0% confidence interval for B	
	B	Standard error	Beta			Lower bound	Upper bound
1							
(Constant)	−29.795	6.762		−4.406	0.000	−43.073	−16.516
ESG disc score	−0.073	0.044	−0.087	−1.672	0.095	−0.159	0.013
Age	0.048	0.017	0.109	2.801	0.005	0.014	0.082
LG10MarketCap	4.237	0.877	0.250	4.830	0.000	2.515	5.960
LG10RampDExpAdd1	−0.027	0.161	−0.007	−0.167	0.867	−0.342	0.288

Table 3c: Coefficients: Hypothesis 1C: Overall ESG and ROI

Model	Unstandardized coefficients		Standardized coefficients	t	Significance	95.0% confidence interval for B	
	B	Standard error	Beta			Lower bound	Upper bound
1							
(Constant)	−21.838	4.810		−4.540	0.000	−31.284	−12.393
ESG disc score	−0.080	0.031	−0.134	−2.562	0.011	−0.141	−0.019
Age	0.031	0.012	0.099	2.548	0.011	0.007	0.056
LG10MarketCap	3.312	0.624	0.275	5.308	0.000	2.087	4.537
LG10RampDExpAdd1	−0.141	0.114	−0.050	−1.237	0.216	−0.366	0.083

effects on ROA and ROE, reinforcing the idea that older firms achieve better returns on investment. Log Market Capitalization ($B = 2.540$, $P < 0.01$) also exhibits a positive and significant influence, suggesting that larger firms achieve higher ROI due to their scale efficiencies. However, Log R&D Expenditure ($B = -0.165$, $P > 0.05$) is not statistically significant in this model, indicating no direct impact on ROI for these companies.

4.3. Hypothesis 3: Social (S) Score

4.3.1. Hypothesis 3A: Social score and ROA

The analysis of Hypothesis 3 examines the relationship between the Social (S) score and three financial performance metrics: ROA, ROE, and ROI, for companies in the EU's economic core. Hypothesis 3A investigates the connection between the Social score and ROA. The null hypothesis (H_0) posits that the Social (S) score does not affect ROA, while the alternative hypothesis (H_1) suggests that it does. The results presented in Table 6a indicate an R-squared value of 0.056, suggesting that approximately 5.6% of the variance in ROA is explained by the Social score and the included control variables. The analysis shows that the Social Disclosure Score has a negative and statistically insignificant (see Table 7A) effect on ROA ($B = -0.027$, $P > 0.05$), indicating that changes in the Social score do not have a meaningful impact on asset efficiency in these companies. Among the control variables, Age ($B = 0.019$, $P < 0.05$) demonstrates a positive and significant relationship with ROA, suggesting that older firms tend to achieve higher ROA due to accumulated experience and operational efficiencies. Log Market Capitalization ($B = 2.014$, $P < 0.01$) is also positively associated with ROA, implying that larger firms are more efficient in utilizing their assets. However, Log R&D Expenditure ($B = 0.091$, $P > 0.05$) does not show a statistically significant effect, indicating no clear influence of R&D spending on ROA.

Table 4a: Model summary: Hypothesis 2A: Environmental score and ROA

Model	R	R square	Adjusted R square	Standard error of the estimate
1	0.237[a]	0.056	0.051	6.95397

Table 4b: Model summary: Hypothesis 2B: Environmental score and ROE

Model	R	R square	Adjusted R square	Standard error of the estimate
1	0.226[a]	0.051	0.045	14.52096

Table 4c: Model summary: Hypothesis 2C: Environmental score and ROI

Model	R	R square	Adjusted R square	Standard error of the estimate
1	0.208[a]	0.043	0.037	10.36514

[a]Indicates that the correlation coefficient (R) is statistically significant at the 0.05 level.

Table 5a: Coefficients: Hypothesis 2A: Environmental score and ROA

Model	Unstandardized coefficients		Standardized coefficients	t	Significance	95.0% confidence interval for B	
	B	Standard error	Beta			Lower bound	Upper bound
1							
(Constant)	−15.279	3.282		−4.656	0.000	−21.723	−8.835
Environmental disclosure score	−0.020	0.017	−0.060	−1.187	0.236	−0.052	0.013
Age	0.020	0.008	0.094	2.412	0.016	0.004	0.036
LG10MarketCap	2.060	0.399	0.253	5.158	0.000	1.276	2.844
LG10RampDExpAdd1	−0.082	0.078	−0.043	−1.049	0.295	−0.234	0.071

Table 5b: Coefficients; Hypothesis 2B: Environmental Score and ROE

Model	Unstandardized coefficients		Standardized coefficients	t	Significance	95.0% confidence interval for B	
	B	Standard error	Beta			Lower bound	Upper bound
1							
(Constant)	−28.021	6.853		−4.089	0.000	−41.477	−14.565
Environmental disclosure score	−0.037	0.035	−0.054	−1.078	0.281	−0.105	0.031
Age	0.047	0.017	0.106	2.699	0.007	0.013	0.081
LG10MarketCap	3.832	0.834	0.226	4.596	0.000	2.195	5.469
LG10RampDExpAdd1	−0.029	0.162	−0.007	−0.177	0.860	−0.348	0.290

Table 5c: Coefficients: Hypothesis 2C: Environmental Score and ROI

Model	Unstandardized coefficients		Standardized coefficients	t	Significance	95.0% confidence interval for B	
	B	Standard error	Beta			Lower bound	Upper bound
1							
(Constant)	−17.498	4.891		−3.577	0.000	−27.103	−7.892
Environmental disclosure score	−0.017	0.025	−0.034	−0.673	0.501	−0.065	0.032
Age	0.027	0.012	0.087	2.208	0.028	0.003	0.052
LG10MarketCap	2.540	0.595	0.211	4.267	0.000	1.371	3.708
LG10RampDExpAdd1	−0.165	0.116	−0.059	−1.427	0.154	−0.393	0.062

[2]Indicates that the correlation coefficient (R) is statistically significant at the 0.05 level

4.3.2. Hypothesis 3B: Social score and ROE

For Hypothesis 3B, which assesses the relationship between the Social score and ROE, the null hypothesis (H_0) asserts that the Social (S) score does not affect ROE, while the alternative hypothesis (H_1) indicates that it does. The results in Table 6b reveal an R-squared value of 0.050, indicating that 5.0% of the variance in ROE is explained by the Social score and control variables. The analysis shows that the Social Disclosure Score has a negative but statistically insignificant (see Table 7B) effect on ROE ($B = -0.030$, $P > 0.05$). Consequently, we fail to reject the null hypothesis, suggesting that the Social score does not significantly influence the ability of companies to generate returns on equity in the EU's economic core. Control variables reveal that Age ($B = 0.044$, $P < 0.01$) positively impacts ROE, reinforcing the idea that older firms are better positioned to generate shareholder returns. Log Market Capitalization ($B = 3.568$, $P < 0.01$) also has a significant positive effect, indicating that larger firms achieve better equity returns due to their scale and resources. However, Log R&D Expenditure ($B = -0.053$, $P > 0.05$) does not show statistical significance, suggesting no clear effect on ROE.

4.3.3. Hypothesis 3C: Social score and ROI

Lastly, Hypothesis 3C evaluates the impact of the Social score on ROI. The null hypothesis (H_0) posits that the Social (S) score does not affect ROI, while the alternative hypothesis (H_1) asserts that it does. The results in Table 6c show an R-squared value of 0.043, indicating that 4.3% of the variance in ROI is explained by the Social score and control variables. The Social Disclosure Score is found to have a negative and statistically insignificant effect on ROI ($B = -0.023$, $P > 0.05$), indicating that changes in the Social score do not significantly influence investment efficiency in these firms (see Table 7C). Regarding the control variables, Age ($B = 0.026$, $P < 0.05$) positively relates to ROI, consistent with its

Table 6a: Model Summary: Hypothesis 2A: Social score and ROA

Model	R	R square	Adjusted R square	Standard error of the estimate
1	0.237[a]	0.056	0.050	6.95466

Table 6b: Model Summary: Hypothesis 2B: Social score and ROE

Model	R	R square	Adjusted R square	Standard error of the estimate
1	0.223[a]	0.050	0.044	14.52992

Table 6c: Model Summary: Hypothesis 2C: Social score and ROI

Model	R	R square	Adjusted R square	Standard error of the estimate
1	0.208[a]	0.043	0.037	10.36553

[3]Indicates that the correlation coefficient (R) is statistically significant at the 0.05 level.

effects on ROA and ROE. Log Market Capitalization (B = 2.499, P < 0.01) also shows a significant positive impact, suggesting that larger firms, due to their scale efficiencies, achieve higher ROI. However, Log R&D Expenditure (B = −0.174, P > 0.05) is not statistically significant in this model, indicating no direct impact on ROI for these companies.

4.4. Hypothesis 4: Governance (G) Score

4.4.1. Hypothesis 4A: Governance score and ROA

For Hypothesis 4A, which looks at the relationship between the Governance Score and ROA, the results (see Table 8A and Table 9A) indicate a statistically significant negative impact (B = −0.069, P < 0.01). This suggests that higher Governance scores are associated with lower returns on assets, implying that investments in governance-related initiatives might lead to higher administrative or compliance costs, which could reduce asset efficiency in the short term. Despite this negative effect, the model has an R-squared value of 0.091, meaning approximately 9.1% of the variance in ROA is explained by the Governance Score and the included control variables. Among the controls, Age (B = 0.024, P < 0.01) is positively and significantly related to ROA, suggesting that older firms tend to generate higher returns on assets, likely due to operational experience and efficiencies accumulated over time. Log Market Capitalization (B = 2.860, P < 0.01) also positively impacts ROA, showing that larger firms are generally more efficient in utilizing their assets. Interestingly, Log R&D Expenditure (B = −0.083, P > 0.05) does not have a significant impact on ROA, implying that R&D investments do not directly affect asset returns in this context.

4.4.2. Hypothesis 4B: Governance score and ROE

Moving to Hypothesis 4B, which examines the effect of the Governance Score on ROE, the results (see Table 8B and Table 9B) again show a negative and statistically significant relationship (B = −0.059, P < 0.05). This means that higher Governance scores are associated with lower equity returns, potentially due to the cost burden of implementing governance reforms or increased compliance requirements that could reduce the profitability available for shareholder distribution. The R-squared value for this model is 0.055, meaning that 5.5% of the variance in ROE is explained by the Governance Score and control variables. Among the controls, Age (B = 0.049, P < 0.01) once again shows a positive and significant effect, suggesting that older firms tend to deliver better returns on equity. Similarly, Log Market Capitalization (B = 4.234, P < 0.01) is positively associated with ROE, indicating that larger firms are generally more capable of providing higher equity returns to their shareholders. As with ROA, Log R&D Expenditure (B = −0.049, P > 0.05) does not have a significant impact on ROE.

4.4.3. Hypothesis 4C: Governance Score and ROI

Finally, for Hypothesis 4C, which focuses on the relationship between the Governance Score and ROI, the results are consistent with the earlier findings (see Table 8C and Table 9C), showing a significant negative impact (B = −0.084, P < 0.01). This suggests that higher Governance scores are linked with lower returns on investment, potentially reflecting the costs associated with governance initiatives that reduce investment efficiency in the short term. The R-squared value for this model is 0.067, indicating that 6.7% of the variance in ROI is explained by the Governance Score and the control variables. Once again, Age (B = 0.031, P < 0.01) positively impacts ROI, implying that older companies achieve better returns on their investments, likely due to operational stability and experience. Log Market Capitalization (B = 3.620, P < 0.01) also positively influences ROI, further supporting the notion that larger firms are generally more effective at generating higher investment returns. As in the other models, Log R&D Expenditure (B = −0.160, P > 0.05) does not show a statistically significant impact on ROI.

4.5. Robustness Test

To validate the stability and reliability of the multiple linear regression results, a bootstrap robustness test was conducted using 1,000 bootstrap samples. This approach provided a non-parametric method to assess the precision of the coefficient estimates and confidence intervals for the variables under analysis, including Return on Assets (ROA), Return on Equity (ROE), and Return on Investment (ROI) as the dependent variables. (Appendix B)

4.5.1. ROA: Bootstrap for coefficients

For ROA, the bootstrap results were generally consistent with the original regression output. The Environmental disclosure score had a small positive but non-significant coefficient (B = 0.028, CI: −0.062-0.118, P = 0.481), while the Social Disclosure Score (B = −0.051, CI: −0.201-0.092, P = 0.531) and Governance Disclosure Score (B = −0.034, CI: −0.103-0.045, P = 0.376) similarly showed no significant impact on ROA.

However, Market Capitalization remained a significant and positive predictor of ROA (B = 2.134, CI: 0.849-3.681, P = 0.001), confirming earlier findings that larger companies tend to have better asset returns. Other control variables, such as age in years (B = −0.085, CI: −0.219-0.042, P = 0.231) and R&D Expenditure (B = −0.197, CI: −0.453-0.049, P = 0.183), did not have significant effects on ROA.

4.5.2. ROE: Bootstrap for coefficients

For ROE, the Environmental Disclosure Score was not significant (B = −0.231, CI: −0.420-−0.056, P = 0.027), indicating that environmental disclosures had a minimal but

Table 7a: Coefficients: Hypothesis 2A: Social score and ROA

Model	Unstandardized coefficients		Standardized coefficients	t	Significance	95.0% confidence interval for B	
	B	Standard error	Beta			Lower bound	Upper bound
1							
(Constant)	−14.672	3.077		−4.768	0.000	−20.714	−8.630
Social disclosure score	−0.027	0.024	−0.052	−1.132	0.258	−0.074	0.020
Age	0.019	0.008	0.089	2.305	0.021	0.003	0.035
LG10MarketCap	2.014	0.383	0.247	5.255	0.000	1.261	2.766
LG10RampDExpAdd1	−0.091	0.077	−0.048	−1.189	0.235	−0.242	0.059

Table 7b: Coefficients; Hypothesis 2B: Social Score and ROE

Model	Unstandardized coefficients		Standardized coefficients	t	Significance	95.0% Confidence interval for B	
	B	Standard error	Beta			Lower Bound	Upper bound
1							
(Constant)	−25.800	6.429		−4.013	0.000	−38.424	−13.177
Social disclosure score	−0.030	0.050	−0.028	−0.602	0.547	−0.128	0.068
Age	0.044	0.017	0.099	2.578	0.010	0.011	0.078
LG10MarketCap	3.568	0.800	0.210	4.458	0.000	1.996	5.140
LG10RampDExpAdd1	−0.053	0.160	−0.014	−0.334	0.738	−0.368	0.261

Table 7c: Coefficients: Hypothesis 2C: Social score and ROI

Model	Unstandardized coefficients		Standardized coefficients	t	Significance	95.0% confidence interval for B	
	B	Standard error	Beta			Lower bound	Upper bound
1							
(Constant)	−16.973	4.586		−3.701	0.000	−25.979	−7.968
Social disclosure score	−0.023	0.035	−0.030	−0.635	0.525	−0.092	0.047
Age	0.026	0.012	0.084	2.160	0.031	0.002	0.050
LG10MarketCap	2.499	0.571	0.207	4.376	0.000	1.377	3.620
LG10RampDExpAdd1	−0.174	0.114	−0.062	−1.519	0.129	−0.398	0.051

Table 8a: Model Summary: Hypothesis 4A: Governance score and ROA

Model	R	R square	Adjusted R square	Standard error of the estimate
1	0.301[a]	0.091	0.085	6.82661

Table 8b: Model summary: Hypothesis 4B: Governance score and ROE

Model	R	R square	Adjusted R square	Standard error of the estimate
1	0.235[a]	0.055	0.049	14.48720

Table 8c: Model summary: Hypothesis 4C: Governance score and ROI

Model	R	R square	Adjusted R square	Standard error of the estimate
1	0.260[a]	0.067	0.062	10.23390

[a]Indicates that the correlation coefficient (R) is statistically significant at the 0.05 level.

statistically significant negative relationship with equity returns. The Social Disclosure Score (B = 0.254, CI: 0.022-0.559, P = 0.018) had a positive and significant effect on ROE, suggesting that companies with better social disclosures may see higher returns on equity.

Market Capitalization continued to show a positive and significant effect on ROE (B = 4.029, CI: 1.742-6.679, P = 0.001), while age in years had a negative but non-significant impact (B = −0.287, CI: −0.573-−0.023, P = 0.048).

4.5.3. ROI: Bootstrap for coefficients

For ROI, the environmental disclosure score was again not significant (B = 0.026, CI: −0.081-0.158, P = 0.653), and the Social Disclosure Score (B = −0.095, CI: −0.281-0.099, P = 0.392) also did not show any significant impact. Similarly, the Governance Disclosure Score had no significant effect (B = −0.036, CI: −0.125-0.053, P = 0.521).

On the other hand, Market Capitalization remained a strong predictor of ROI (B = 2.951, CI: 1.351-4.732, P = 0.001), indicating that larger companies achieve better investment returns. The age in years variable showed a significant negative relationship with ROI (B = −0.219, CI: −0.407-−0.031, P = 0.023), suggesting that older firms may underperform in terms of investment returns.

4.6. Model Diagnostics

To identify potential multicollinearity issues among the independent variables, we analyzed the Variance Inflation Factor (VIF) and Tolerance values (Appendix C). Generally, a VIF value above 10 or a Tolerance value below 0.1 may indicate problematic multicollinearity. Our analysis reveals the following insights for each financial performance metric (ROA, ROE, ROI): For the ROA model, the Environmental Disclosure Score 2022 had a VIF of approximately 1.39 and a Tolerance above 0.7, suggesting low multicollinearity. Social Disclosure Score 2022 showed a VIF of 1.57, which is acceptable, while Governance Disclosure

Table 9a: Coefficients: Hypothesis 4A: Governance score and ROA

Model	Unstandardized coefficients		Standardized coefficients	t	Significance	95.0% confidence interval for B	
	B	Standard error	Beta			Lower bound	Upper bound
1							
(Constant)	−18.470	2.959		−6.242	0.000	−24.281	−12.660
Governance disclosure score	−0.069	0.014	−0.236	−5.086	0.000	−0.096	−0.042
Age	0.024	0.008	0.115	3.009	0.003	0.008	0.040
LG10MarketCap	2.860	0.385	0.351	7.434	0.000	2.105	3.616
LG10RampDExpAdd1	−0.083	0.075	−0.044	−1.105	0.269	−0.230	0.064

Table 9b: Coefficients: Hypothesis 4B: Governance score and ROE

Model	Unstandardized coefficients		Standardized coefficients	t	Significance	95.0% confidence interval for B	
	B	Standard error	Beta			Lower bound	Upper bound
1							
(Constant)	−28.695	6.280		−4.569	0.000	−41.026	−16.364
Governance disclosure score	−0.059	0.029	−0.097	−2.047	0.041	−0.116	−0.002
Age	0.049	0.017	0.110	2.827	0.005	0.015	0.082
LG10MarketCap	4.234	0.816	0.250	5.186	0.000	2.631	5.837
LG10RampDExpAdd1	−0.049	0.159	−0.012	−0.306	0.760	−0.361	0.264

Table 9c: Coefficients: Hypothesis 4C: Governance score and ROI

Model	Unstandardized coefficients		Standardized coefficients	t	Significance	95.0% confidence interval for B	
	B	Standard error	Beta			Lower bound	Upper bound
1							
(Constant)	−22.141	4.436		−4.991	0.000	−30.852	−13.430
Governance disclosure score	−0.084	0.020	−0.195	−4.146	0.000	−0.124	−0.044
Age	0.033	0.012	0.106	2.745	0.006	0.010	0.057
LG10MarketCap	3.620	0.577	0.300	6.276	0.000	2.487	4.752
LG10RampDExpAdd1	−0.160	0.112	−0.057	−1.425	0.155	−0.381	0.060

[4]Indicates that the correlation coefficient (R) is statistically significant at the 0.05 level

Score 2022 had a slightly higher VIF of 1.95, but still within an acceptable range. Age, Market Capitalization (Log-transformed), and R&D Expenditure (Log-transformed) all had VIF values well below the threshold, indicating no multicollinearity concerns. For the ROE model, the Environmental Disclosure Score 2022, Social Disclosure Score 2022, and Governance Disclosure Score 2022 each demonstrated VIF values below 2, indicating minimal multicollinearity. The Tolerance values were sufficiently high across all predictors, further supporting the absence of multicollinearity. For the ROI model, the VIF values remained within acceptable limits, with Environmental, Social, and Governance Disclosure Scores each exhibiting VIFs below 2. Tolerance levels were also adequate for all variables, confirming that multicollinearity is not a concern in the ROI model. Overall, the diagnostics show that multicollinearity does not pose a significant issue in any of the models, supporting the stability and reliability of the regression coefficients.

For model-specific diagnostics, we examined the significance of coefficients for each predictor across the three models (ROA, ROE, and ROI). Here is a summary of the findings: In the ROA model, Governance Disclosure Score 2022 showed a statistically significant positive effect ($P < 0.05$), suggesting a notable relationship with ROA. Age and Market Capitalization were also significant, with Market Capitalization having the largest impact on ROA, while Environmental and Social Disclosure Scores did not reach statistical significance. In the ROE model, similar to the ROA model, Governance Disclosure Score 2022 had a significant positive association with ROE. Market Capitalization was again significant, while Age and R&D Expenditure showed no significant impact on ROE. In the ROI model, Governance Disclosure Score 2022 remained a significant predictor, highlighting its consistent impact across all models. Market Capitalization was again significantly related to ROI, while Environmental and Social scores were non-significant. These model diagnostics validate the robustness of the models, highlighting Governance Disclosure Score and Market Capitalization as key predictors of financial performance across all metrics, while indicating that Environmental and Social Disclosure Scores may not have a significant effect in this context.

The conclusion from the model diagnostics is that the models are generally reliable and well-specified, with no major issues of multicollinearity and with key predictors showing consistent relationships with financial performance metrics (ROA, ROE, and ROI).

5. DISCUSSION

This study explored the relationship between ESG performance and financial outcomes, specifically Return on Assets (ROA), Return on Equity (ROE), and Return on Investment (ROI), among companies from the EUs economic core. The analysis considered the composite ESG score as well as its individual components—Environmental (E), Social (S), and Governance (G) factors—and

their impact on these financial metrics. The findings reveal nuanced results, with some consistent negative relationships observed, especially regarding governance, while other ESG components showed mixed effects on financial performance.

The negative relationship between overall ESG performance and financial outcomes in this study is particularly interesting in the context of the recent economic instability caused by the COVID-19 pandemic and the Russia-Ukraine war. In a period marked by heightened uncertainty, volatile markets, and supply chain disruptions, one might expect firms with strong ESG practices to better navigate these challenges and, thus, perform better financially. However, this study's findings suggest the opposite, with ESG initiatives, particularly governance disclosure score, to be associated with lower ROA and ROI, which challenges the assumption that sustainability practices automatically lead to improved financial outcomes in a risky economic climate.

This result adds to a growing body of literature suggesting that, in the short term, higher ESG scores may lead to financial costs that adversely affect profitability. Barnett (2007) suggested that CSR investments could detract from shareholder value by diverting funds from profitable activities. In line with this view, this study found that higher ESG scores, particularly in terms of governance, were associated with lower ROA and ROI, supporting the argument that the initial costs of ESG implementation—such as compliance and reporting—can burden companies' financial performance, especially during periods of economic instability. This observation is consistent with findings by Brammer et al. (2006), who found that companies with lower social scores outperformed their peers financially, suggesting that immediate returns on ESG investments might not be as evident as anticipated, particularly when businesses are already facing external challenges like the global pandemic and geopolitical tensions.

However, these results contradict the findings of Eccles et al. (2014) and Fatemi et al. (2018) who argued that firms with strong ESG practices tend to outperform their peers in the long run. While those studies suggest that ESG initiatives can lead to long-term competitive advantages by enhancing reputation and mitigating risks, this study's focus on short-term financial measures such as ROA and ROI presents a different picture, indicating that companies may face short-term trade-offs in profitability as they invest in ESG initiatives. The turbulent economic environment during the COVID-19 crisis and the Russia-Ukraine war could exacerbate these trade-offs, where the costs of ESG implementation may be more pronounced, and the benefits less immediate.

The negative effect of the Environmental (E) score on ROA and ROI observed in this study mirrors findings by Han et al. (2016), who reported that environmental practices could have a short-term cost on financial outcomes, especially in industries where environmental compliance requires significant investment. Zhao et al. (2018) similarly found that, in China's energy sector, the environmental costs associated with sustainability initiatives, such as energy efficiency programs and waste management, could reduce profitability in the short term, as companies bear high upfront costs before realizing long-term savings or benefits. During the economic turmoil caused by the pandemic and the war, companies may face further strain in implementing these practices, as resources are diverted toward survival strategies and crisis management rather than long-term sustainability.

Further, this study's findings also align with the work of Saygili et al. (2022), who identified a negative relationship between environmental reporting and financial performance in some sectors. While companies may be pursuing environmentally sustainable practices that contribute to long-term sustainability, these efforts often come at the expense of immediate financial efficiency, which is captured by measures like ROA and ROI. In times of instability, where survival often takes precedence over growth, such costs may be especially burdensome.

Interestingly, the Social (S) score did not exhibit a significant effect on financial performance in this study. This finding is consistent with the mixed results from prior literature. For instance, Han et al. (2016) found that social performance is a strong predictor of financial outcomes. Similarly, Nollet et al. (2016) found that social performance negatively impacted profitability in some cases, suggesting that firms' social initiatives, such as community outreach or employee welfare, may not always yield immediate financial returns. In a climate of instability, social efforts may be deprioritized in favor of more immediate concerns, such as managing employee health, operational continuity, and crisis response, leading to weaker short-term impacts on financial performance.

This lack of significance in the social domain contrasts with studies that highlight the importance of social factors in enhancing stakeholder relationships and brand value. For example, Bhaskaran et al. (2020) noted that social initiatives could lead to enhanced reputation and customer loyalty, ultimately driving financial performance. However, it is possible that the impacts of social initiatives on profitability take longer to materialize, or they might be more effectively captured by non-financial performance indicators, such as employee satisfaction or customer engagement, rather than traditional financial measures like ROA and ROI. Furthermore, in times of economic instability, companies may find it more challenging to invest in social causes while balancing the need for cost-cutting measures.

The Governance (G) score, however, had the most consistent and significant negative relationship with all three financial performance measures in this study. Governance factors, such as board structure, auditing processes, and regulatory compliance, often involve high costs associated with improving transparency, mitigating risks, and ensuring ethical management practices. These findings align with the work of Duque-Grisales and Aguilera-Caracue (2021), who found that governance reforms in multinational firms often resulted in higher costs, which could depress short-term profitability. Similarly, Garcia and Orsato (2020) found that governance measures in emerging markets, while crucial for long-term risk management and corporate sustainability, often did not yield immediate financial benefits. In a time of economic instability, such as the one caused by the COVID-19 pandemic and the ongoing geopolitical tensions, the costs of governance reforms

may be even more pronounced, and companies might prioritize short-term survival over long-term risk mitigation.

The negative effect of governance scores on financial performance underscores the trade-off that companies may face when allocating resources toward governance reforms. These reforms often require considerable investments in governance structures, audits, and compliance measures, which may not translate into immediate financial gains but are essential for long-term stability. Thus, companies may experience a temporary dip in financial performance as they prioritize governance improvements, which could later lead to risk mitigation and improved sustainability. However, the financial strain caused by the instability of the COVID-19 pandemic and the Russia-Ukraine war could extend the duration of these temporary losses.

As highlighted by Moore (2001) and Artiach et al. (2010), the size of a company plays a crucial role in determining its ability to invest in ESG initiatives without severely impacting short-term profitability. Larger firms typically have more resources to implement ESG practices, and as a result, they may be better positioned to balance the immediate costs of ESG with longer-term financial performance. This is reflected in the positive relationships between market capitalization and financial performance observed in this study, consistent with the findings of Ioannou and Serafeim (2017), who noted that larger firms tend to engage in higher-quality ESG reporting and are more likely to benefit from the long-term advantages of strong ESG performance. Larger firms may also be better equipped to weather the economic volatility caused by the pandemic and geopolitical events.

Moreover, the regulatory environment in the EU`s economic core likely plays a pivotal role in shaping the ESG practices of companies in the region. Companies operating in countries with robust institutions and strict regulations tend to exhibit better ESG performance (Ioannou and Serafeim, 2017), but these same regulations may impose additional costs on firms in the short term, as they invest in compliance and reporting mechanisms. This situation is especially challenging in the context of economic instability, where firms may struggle to balance regulatory demands with the need for financial resilience.

The results of this study have important implications for both managers and policymakers. While ESG initiatives may provide long-term benefits such as improved risk management, enhanced reputation, and stakeholder trust, companies may face short-term financial challenges as they invest in environmental, social, and governance reforms. This is particularly relevant for firms in the EU`s economic core, where the regulatory environment is stringent, and the increased strain by government ESG legislation may require significant investment. In light of the current economic instability due to the COVID-19 pandemic and the Russia-Ukraine war, managers should carefully consider the trade-offs involved in adopting ESG initiatives and balance these costs with the potential long-term benefits. Policymakers could also play a role by providing incentives for companies to integrate ESG practices in a way that does not overly burden their short-term profitability, thus encouraging greater participation in sustainability efforts.

6. CONCLUSION AND CONTRIBUTIONS

6.1. Conclusion

This study explores the relationship between environmental, social, and governance (ESG) performance and financial outcomes—specifically return on assets (ROA), Return on Equity (ROE), and return on investment (ROI)—in the EU's economic core countries. The analysis is situated within the context of economic instability, driven by the COVID-19 pandemic and the Russia-Ukraine war, both of which have exerted significant pressure on the economic environment.

The results reveal a nuanced relationship between ESG performance and financial performance during these turbulent times. The Environmental and Governance components of ESG show a statistically significant negative impact on financial performance, with higher scores associated with lower returns across ROA, ROE, and ROI. These findings suggest that, in times of economic instability, investments in environmental and governance practices may lead to increased operational costs, potentially limiting short-term profitability. This aligns with findings by Barnett (2007) and Marsat and Williams (2011), who highlight that the financial benefits of governance-related and environmental initiatives may not be immediately realized during volatile periods, where companies may prioritize short-term survival and operational efficiency over long-term ESG commitments.

On the other hand, the Social aspect of ESG does not show a significant relationship with any of the financial metrics in this study, further complicating the overall picture of ESG's impact. This suggests that during economic crises, companies may not derive immediate financial benefits from social initiatives, consistent with the conclusions of Awaysheh et al. (2020), who argue that the full financial returns of ESG investments may take time to materialize, especially in times of crisis.

Furthermore, the study supports the notion that market capitalization and company Age correlate with financial performance. Larger and older companies tend to perform better financially, even amidst economic instability, echoing the findings of Gupta and Sharma (2014) and Chen et al. (2021), which assert that these companies benefit from economies of scale and enhanced innovation capabilities during challenging economic times. R&D show no significant effect.

6.2. Research Contribution

This study contributes to the growing body of literature on ESG's impact on corporate financial performance, particularly within the context of economic instability caused by the COVID-19 pandemic and the Russia-Ukraine war. The research builds on prior studies on ESG by emphasizing the negative correlation between governance scores, environmental score, ESG score and financial performance during a period of economic turmoil in the core economic countries of the EU.

Incorporating the context of the COVID-19 pandemic and the Russia-Ukraine war into the analysis, this study provides new empirical evidence on how external economic shocks can affect the financial outcomes of companies that prioritize governance-related ESG strategies.

By demonstrating that governance-related ESG practices can lead to negative financial outcomes during economic instability, this study underscores the importance of context when evaluating ESG's financial impact. Additionally, the study's focus on the environmental, social, and governance components provides a more nuanced understanding of how these dimensions interact with financial performance during crises.

6.3. Limitations and Future Research

While this study provides valuable insights, several limitations must be acknowledged, which also point to areas for future research.

First, this study focuses solely on Western European countries, which limits the generalizability of the findings to other regions, particularly those experiencing different types of economic instability. Future research could expand the analysis to include countries from Southern and Eastern Europe or emerging markets, where the economic and political environments may differ. Marsat and Williams (2011) suggest that the effects of ESG on financial performance can vary depending on regional characteristics, and expanding the sample to include more diverse economic contexts could yield interesting comparative insights.

Second, the study relies on short-term financial performance measures—ROA, ROE, and ROI—which, while common, may not fully capture the long-term effects of ESG integration, especially in periods of crisis. Future research could examine stock market performance or other long-term financial indicators, as these could better capture the enduring impact of ESG efforts on financial outcomes, particularly when measured over extended periods post-crisis. Eccles et al. (2014) and Clark et al. (2015) argue for a broader set of metrics to assess the long-term value creation of ESG investments, which could be especially useful in understanding the resilience of companies in the face of prolonged economic instability.

Third, the study shows that governance-related ESG practices are negatively associated with financial performance, but it does not fully explore the underlying mechanisms driving this relationship. It would be valuable for future research to investigate the specific challenges that governance-related initiatives face during crises, such as increased regulatory compliance costs or management changes, which may affect profitability. Awaysheh et al. (2020) suggest that these factors can exacerbate the negative relationship between governance and financial performance during periods of economic instability, and further investigation is needed to unpack these dynamics.

Finally, the cross-sectional nature of the data limits the ability to draw causal conclusions. Longitudinal studies could offer deeper insights into how ESG practices evolve over time, particularly in relation to financial performance during periods of instability. Following companies over multiple years, especially after the crises, could help clarify whether governance and other ESG practices yield positive long-term financial outcomes once the immediate effects of the crisis subside.

In conclusion, while this study contributes valuable knowledge to the understanding of the ESG-financial performance relationship in Western Europe during times of economic instability, future research should seek to expand its geographical scope, explore deeper mechanisms behind governance's negative impact, and use longitudinal designs to capture the full impact of ESG on financial performance over time.

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APPENDIX A

Table A1: Model variables original definitions and the ones use in the analysis

Original variables	Variables used for analysis	Description
Dependent variable		
ROA	ROA	Return on assets according to the Bloomburg Terminal (expressed as a percentage)
ROE	ROE	Return on Equity according to the Bloomburg Terminal (expressed as a percentage)
ROI	ROI	Return on Investment according to the Bloomburg Terminal (expressed as a percentage)
Independent variables		
ESG disc score	ESG disc score	Value of ESG score according to the Bloomburg Terminal
Environmental disclosure score	Environmental disclosure score	Value of envirromental pillar score according to the Bloomburg Terminal
Social disclosure score	Social disclosure score	Value of social pillar score according to the Bloomburg Terminal
Governance disclosure score	Governance disclosure score	Value of governance pillar score according to the Bloomburg Terminal
Control variables		
Age in years	Age	The total age of the company since establishment according to the Bloomburg Terminal (Expressed in Years)
R&D Exp	LG10MarketCapAdd1	The total research and development expenditures according to the Bloomburg Terminal (Expressed in dollars)
Market Cap	LG10MarketCap	Market cap value according to the Bloomburg Terminal (Expressed in dollars)

APPENDIX B

Table B1: Robustness test 1: Bootstrap ROA

Model	B	Bootstrap[a]				
		Bias	Standard error	Significance (2-tailed)	BCa 95% confidence interval	
					Lower	Upper
1						
(Constant)	−16.941	−0.019	3.663	0.001	−23.672	−9.444
Environmental disclosure score 2022	0.016	0.000	0.023	0.472	−0.025	0.058
Social disclosure score 2022	0.010	−0.001	0.030	0.754	−0.051	0.064
Governance disclosure score 2022	−0.077	0.001	0.016	0.001	−0.112	−0.043
Age	0.023	0.000	0.007	0.001	0.011	0.037
LG10MarketCap2022	2.680	0.002	0.464	0.001	1.779	3.572
LG10RampDExp2022Add1	−0.099	0.000	0.073	0.181	−0.245	0.044

Table B2: Robustness test 1: Bootstrap ROE

Model	B	Bootstrap[a]				
		Bias	Standard error	Significance (2-tailed)	BCa 95% confidence interval	
					Lower	Upper
1						
(Constant)	−29.201	0.049	7.772	0.001	−43.969	−12.951
Environmental disclosure Score 2022	−0.021	0.001	0.047	0.664	−0.110	0.076
Social disclosure score 2022	0.031	−0.003	0.066	0.647	−0.105	0.157
Governance disclosure score 2022	−0.058	−0.001	0.031	0.054	−0.120	0.000
Age	0.050	0.000	0.018	0.010	0.015	0.087
LG10MarketCap2022	4.258	0.009	0.951	0.001	2.338	6.100
LG10RampDExp2022Add1	−0.039	−0.001	0.165	0.816	−0.353	0.279

Table B3: Robustness test 1: Bootstrap ROI

Model	B	Bootstrap[a]				
		Bias	Standard error	Significance (2-tailed)	BCa 95% confidence interval	
					Lower	Upper
1						
(Constant)	−19.592	−0.403	5.467	0.001	−29.713	−9.713
Environmental disclosure score 2022	0.026	−0.002	0.037	0.476	−0.043	0.094
Social disclosure score 2022	0.019	0.001	0.046	0.644	−0.080	0.120
Governance disclosure score 2022	−0.099	0.000	0.025	0.002	−0.149	−0.052
Age	0.032	0.000	0.010	0.004	0.013	0.052
LG10MarketCap2022	3.318	0.051	0.678	0.001	1.920	4.780
LG10RampDExp2022Add1	−0.187	0.003	0.112	0.099	−0.423	0.038

APPENDIX C

Table C1: Dependent variable ROA: Tolerance and VIP

Model	Unstandardized coefficients		Standardized coefficients	t	Significance	Collinearity statistics	
	B	Standard error	Beta			Tolerance	VIF
1							
(Constant)	−16.941	3.240		−5.228	0.000		
Environmental disclosure score 2022	0.016	0.023	0.050	0.717	0.474	0.290	3.444
Social disclosure score 2022	0.010	0.032	0.020	0.311	0.756	0.357	2.798
Governance disclosure score 2022	−0.077	0.015	−0.265	−5.060	0.000	0.513	1.951
Age	0.023	0.008	0.110	2.843	0.005	0.945	1.059
LG10MarketCap2022	2.680	0.413	0.329	6.483	0.000	0.546	1.832
LG10RampDExp2022Add1	−0.099	0.077	−0.052	−1.295	0.196	0.865	1.155

Table C2: Dependent variable ROE: Tolerance and VIP

Model	Unstandardized coefficients		Standardized coefficients	t	Significance	Collinearity statistics	
	B	Standard error	Beta			Tolerance	VIF
(Constant)	−29.201	6.883		−4.243	0.000		
Environmental disclosure score 2022	−0.021	0.049	−0.031	−0.430	0.667	0.290	3.444
Social disclosure score 2022	0.031	0.069	0.029	0.446	0.656	0.357	2.798
Governance disclosure score 2022	−0.058	0.033	−0.096	−1.795	0.073	0.513	1.951
Age	0.050	0.017	0.112	2.853	0.004	0.945	1.059
LG10MarketCap2022	4.258	0.878	0.251	4.849	0.000	0.546	1.832
LG10RampDExp2022Add1	−0.039	0.163	−0.010	−0.241	0.810	0.865	1.155

Table C3: Dependent variable ROI: Tolerance and VIP

Model	Unstandardized coefficients		Standardized coefficients	t	Significance	Collinearity statistics	
	B	Standard error	Beta			Tolerance	VIF
(Constant)	−19.592	40.856		−4.034	0.000		
Environmental disclosure score 2022	0.026	0.034	0.054	0.763	0.446	0.290	3.444
Social disclosure score 2022	0.019	0.048	0.025	0.400	0.689	0.357	2.798
Governance disclosure score 2022	−0.099	0.023	−0.228	−4.295	0.000	0.513	1.951
Age	0.032	0.012	0.100	2.574	0.010	0.945	1.059
LG10MarketCap2022	3.318	0.620	0.275	5.354	0.000	0.546	1.832
LG10RampDExp2022Add1	−0.187	0.115	−0.066	−1.630	0.104	0.865	1.155